for converting among rectangular, cylindrical, and spherical coordinates. Also attached is a page of the table of contents from a college textbook (Boas), showing 50 pages devoted to coordinate transformations.

The rejection is believed to be akin to rejecting a claim because the specification mentions a cosine but does not define it; with respect, no one skilled in the art would be unable to quickly find either the definition of a cosine or the formulas to convert coordinates, and very likely would remember either one without any need to consult a handbook.

Withdrawal of the rejection is requested.

[7-8] Claims 1-8 were rejected under §103 over Kichury in view of Teo. This rejection is respectfully traversed. Kichury is directed to a realistic bumpy self-shadowed method, and it is not related to a method dealing with light inconsistency. Furthermore, if the technology recited in Teo and that in Kichury are combined together, Kichury's realistic bumpy self-shadowing would be destroyed. Therefore, it would not have been obvious to combine the references.

Kichury. Kichury is directed to a method and apparatus for expeditiously rendering realistic bumpy self-shadowed textured computer graphics (col. 2, lines 47-49), and is intended for rendering rough objects. Planar methods cannot create roughness, and Kichury uses texture illumination mapping derived from digital photos or roughness models (col. 4, lines 51-65). The illuminated texture images are superimposed and blended according to their weighted illumination contributions from their corresponding light sources to create a blended texture map. This blended texture map is then mapped onto the surface of the geometric object, which is made up of polygons (col. 4, line 33). By superimposing shadows from several point sources of light creates a realistic bumpy self-shadowed computer graphic image.

In general, the blended, illuminated texture images are are described by equation 2 where intensity is the combined pixel intensity at (x,y) to be computed, $image_i$ is the sampled image pixel, n is the number of texture sample images (light sources), Light is the normalized light

vector from the center of the sampled images to the light source illuminating the object at render time, and $DirVec_i$ is the normalized direction vector paired with the sampled $image_i$, that specifies the direction of the light when the $image_i$ was obtained. (col. 5, line 40-45).

Thus, Kichury is directed to blending illuminated texture images together on a single plane surface, not to concealing light inconsistency.

Teo. Teo is directed to a method for the composition of two digital images which overlap in an overlapping pixel region, so as to avoid "ghosting" when aligning the two images (col. 3, line 30). The brightness, contrast and gamma factors of each of the digital images are modified so as to produce modified brightness, contrast, and gamma. factors, denoted by α, β, and γ, respectively. These modified brightness, contrast and gamma factors are applied by changing the color intensity, denoted by I, of at least one of the digital images to a modified, color intensity, denoted by I', according to the formula : $I' = \alpha + \beta + \gamma$, (col. 4, line 15)., as the one image blends into the other in the feathering region.

The Asserted Combination. If Teo were combined with Kichury (not admitted), there would be an inconsistency in the textures of the different images in the overlapped regions. Superimposing one rough surface image onto another would destroy the roughness.

The surface of Kichury's 3-dimensional object has different normal directions at each polygon, and the size varies. Some of the feathering regions close to the image plane and parallel with each other occupy more pixels of an image; some of the feathering regions far from the image plane, and with a big angle difference, occupy few pixels of the image. Therefore, the overlapped image region variation is very consistent, which is not like a 2-dimensional image composition. These factors affect the precision of the α, β, γ calculation.

Combining the technology of 2D images with the technology of 3D texture images is not trivial (this was argued previously). With respect, the relationship between the image and the 3D model is not obvious and it is not clear that the combination would work.

In summary: Kichury is related to a method and apparatus for expeditiously rendering realistic bumpy self-shadowed textured computer graphics. Illuminated texture images of an object are obtained and stored in a data base as texture maps. These illuminated texture images are superimposed on top of each other and blended according to their weighted illumination contributions from the light sources to create a blended texture map. This blended texture map is then mapped to the desired surface of the geometric object. However, Kichury is not directed to canceling the light inconsistency from different angles. Teo is directed to canceling light discontinuity in the composition of two digital images which overlap in an overlapping pixel region. If Teo and Kichury were combined (not admitted), a conflict would arise. Therefore, it is not obvious to combine Teo with Kichury.

The dependent claims are patentable for depending from claim 1.

Allowance is requested.

Respectfully submitted,

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<u>November 28, 2005</u>
Date

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I certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office (fax no.571-273-8300) on November 28, 2005.

Nick Bromer [reg. no. 33,478] *Signature* Nick Bromer

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MATHEMATICAL HANDBOOK

of

Formulas and Tables

BY

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[illegible]

A point P can be located by spherical coordinates (r, θ, ϕ) [see Fig. 12-8] as well as rectangular coordinates (x, y, z).

The transformation between those coordinates is

12.19
$$\begin{cases} x = r\sin\theta\cos\phi \\ y = r\sin\theta\sin\phi \\ z = r\cos\theta \end{cases}$$

or
$$\begin{cases} r = \sqrt{x^2+y^2+z^2} \\ \phi = \tan^{-1}(y/x) \\ \theta = \cos^{-1}\left(z/\sqrt{x^2+y^2+z^2}\right) \end{cases}$$

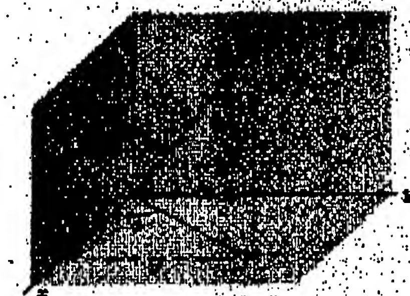

Fig. 12-8

[illegible]

12.20
$$(x-x_0)^2 + (y-y_0)^2 + (z-z_0)^2 = R^2$$

where the sphere has center (x_0, y_0, z_0) and radius R.

Fig. 12-9

EQUATION OF SPHERE IN CYLINDRICAL COORDINATES

12.21
$$r^2 - 2r_0 r\cos(\theta-\theta_0) + r_0^2 + (z-z_0)^2 = R^2$$

where the sphere has center (r_0, θ_0, z_0) in cylindrical coordinates and radius R.

If the center is at the origin the equation is

12.22
$$r^2 + z^2 = R^2$$

EQUATION OF SPHERE IN SPHERICAL COORDINATES

12.23
$$r^2 + r_0^2 - 2r_0 r\sin\theta\sin\theta_0\cos(\phi-\phi_0) = R^2$$

where the sphere has center (r_0, θ_0, ϕ_0) in spherical coordinates and radius R.

If the center is at the origin the equation is

12.24
$$r = R$$

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